MILITARY SURGERY IN WORLD WAR II

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A BACKWARD GLANCE AND A FORWARD LOOK

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A DISTINGUISHED alumnus of Harvard University, Walter Lippmann, recently quoted what he identified only as the remark of a discouraged man: the lesson of history is that the lesson of history is never learned. Certainly, that statement holds for almost every phase of military surgery. We did not profit by the experience of World War I, much less that of previous wars, and in many respects it took us a discouragingly long time to comprehend the lessons that took form during World War II.

Perhaps the chief reason for our early difficulties in World War II is that we had not read the official British and American histories of World War I. Major General Philip Mitchiner, in 1944, confessed that sin of omission for the Royal Army Medical Corps, and it is open to question whether some American medical officers even now know that the histories exist. A partial explanation may be that the American history was published too long after the war had ended. By the time the first volume appeared, American physicians had dismissed from their minds most of the recollections of World War I, and in 1929, when the last volume appeared, a second world war still seemed inconceivable.

Trench foot, which is a responsibility of Command quite as much as of the Medical Corps, is an excel-

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lent illustration of a lesson that we should have learned and did not. In the spring of 1943 the campaign in the Aleutians produced several hundred cases of what was termed "immersion foot." In the following winter there were several thousand cases of what was unmistakably trench foot among the Fifth Army components fighting on the Italian Front. In the winter of 1944–1945 there were some 50,000 cases among the American forces fighting on the Western Front, the first concentrations of cases occurring during the critical days of the Battle of the Ardennes Bulge. The great majority of those cases, it is fair to say, should never have occurred. Larrey, Napoleon's surgeon, had written a classic description of the condition, which contained many a useful warning, well over a century before. Trench foot, under other names, was reported in the Crimean, the Russo-Japanese and the Balkan wars. The British armies in Flanders and on the Somme had learned about it the hard way in World War I and had remembered the lesson through the years; trench foot was no problem among the British troops in World War II. We ourselves had had the experience in the Aleutians to prepare us for Italy, and that in Italy to prepare us for the Western Front. In fact, in the summer of 1944 the débacle of the coming winter on that front was clearly prophesied by the Surgeon General's Office. It is small consolation to reflect that had the Pacific War required the invasion of Japan and Manchuria, where the conditions of winter fighting in Europe would have been duplicated, the incidence of trench foot would probably have been minimal, for prophylaxis had been most carefully planned on both Command and Medical Corps levels.

Other illustrations can be mentioned only briefly. If, for instance, we had read of or had remembered the many and futile attempts in World War I to sterilize wounds by means of antiseptics, we should

have known better than to put our faith in any extraneous substances, including the sulfonamides, on which we leaned so heavily in the early days of World War II. If we had read nothing more than the report of the Inter-Allied Surgical Conference in Paris in 1917, we should have known and could have put into immediate practice all the essential principles in the management of war wounds that were finally learned after many months of costly experience in World War II.

Medicomilitary lessons, like strictly professional lessons, were also learned the hard way. The possibilities of body armor, for example, were discussed in considerable detail in the history of the American Medical Department in World War I. Protective devices were adopted in World War II by the Air Force, with considerable savings in deaths and wounds, by the end of 1943. On the basis of this experience, small though it was, and of several intensive studies on the lethality of weapons, it should have been apparent that great benefits might be derived from further developments in this field. Available statistics suggested that their adoption might reasonably be expected to reduce the number of men killed in action by 12 per cent and of those wounded in action by 8 per cent, but the Pacific War ended before body armor was in use on any front.

Convalescent camps, which were authorized for each hospital group in May, 1918, formed no part of the original planning for World War II and were provided, as in World War I, only after experience had shown that they were needed. Field hospitals for major surgical procedures were not planned in World War I for nontransportable patients who required prompt life-saving surgery, but were developed when the need became evident. It is ironic that in World War II the same evolution was necessary, although little reflection seems needed to make

it plain that many of the injuries responsible for the greatest loss of life must be treated at this level if salvage is to be accomplished. At the end of the war, the field hospital still did not have tables of organization and equipment and, in the minds of administrative personnel, was still not fully accepted

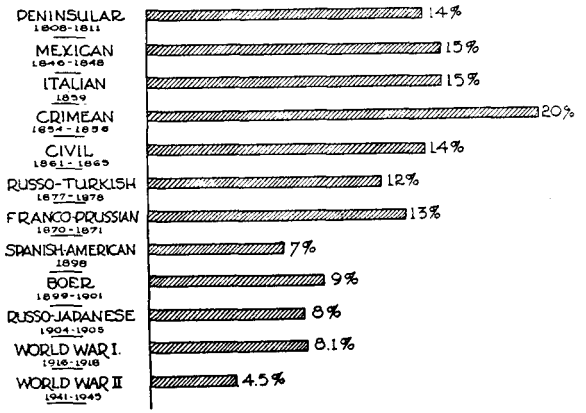

FIGURE 1. *Mortality of Wounded in Various Wars.*

for the purposes it was serving, although it was the only available unit that could have been modified and made sufficiently flexible to meet them.

Whether a valid appraisal of the surgery in World War II is possible at this time is seriously doubtful. In the first place, we are still much too close to what has happened to permit comments that would be entirely objective; too many considerations, many of which have nothing to do with medicine, are likely to color our thinking, and under the circumstances overenthusiasm would be quite as much an obstacle to objectivity as prejudice or indifference.

In the second place, a much longer time will be required to analyze all the medical data statistically and qualitatively. Representative samples, however, permit definitive conclusions and make clear the salvage that occurred in World War II, both absolutely and as compared with that in previous wars, in spite of our failure to learn the lessons of those wars.

From the Peninsular War, which began in 1808, through World War I, a period of more than a century, the proportion of men dying of battle

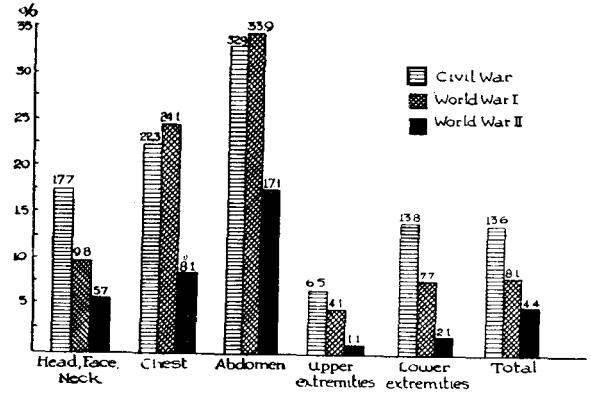

FIGURE 2. *Mortality in Various Wars according to Location of Wound.*

wounds was almost halved (Fig. 1). In World War II, which occurred only twenty-five years later, the proportion of men dying of battle wounds was again almost halved, although the number of wounded exceeded those in any previous war so recorded that estimates are possible. The absolute magnitude of these gains is not in any way invali-

dated by the unhappy realization that had we learned our lessons earlier, the salvage might have been still greater.

The case fatality rates of World War II, when examined from the standpoint of regional injuries, were from 25 to 50 per cent lower than those of World War I, which themselves showed a considerable reduction over comparable rates in the Civil War (Fig. 2). For the sites that were potentially the most fatal — that is, the head, chest and abdomen — the rates in World War II were a half to two thirds below those in World War I.

Finally, to examine the gross statistics from still another standpoint, had the death rates after wounding that obtained in World War I been duplicated, almost 22,000 more deaths would probably have occurred in World War II (Fig. 3). This is a total salvage of 45 per cent, and on a relative basis the calculated savings equal or exceed 35 per cent for every region of the body. Although comparable figures are not available, I am convinced that the salvage in morbidity was even greater.

The Background of Military Surgery

Before discussion of how these improvements were brought about in World War II, it is well to consider the background against which military surgery must be done. The surgery of a modern war has been aptly defined as the surgery of trauma in epidemic proportions. The demand is so enormous that it can be met only by a closely co-ordinated, well integrated medical organization prepared to operate promptly, efficiently and simultaneously under widely varying conditions and in all parts of the world. The organization must be highly mobile, so that it can move with the battle; otherwise it will lose its usefulness. It must function without interfering with the battle; the first objective is to get on with the fighting, and to fail in it or to impede it would not be to the best interests of the wounded, either individually or en masse.

The medical organization must operate long lines of evacuation from the front, where injury occurs and first-aid measures are carried out, to the rear, where definitive treatment is given, and thence to the homeland, where final therapeutic measures are applied. At the same time it must be prepared to treat well toward the front lines both men who are so lightly wounded that they can be promptly returned to duty and those who are so seriously wounded that they cannot be moved farther without treatment, or who require without delay operations of such a character as to prohibit transport immediately afterward. The whole process of evacuation, in fact, must be conducted on the basis of the transportability of the patient, which is itself predicated on the character of the injury, the physiologic reaction of the patient and the therapeutic measures employed.

All the circumstances of war surgery thus do violence to civilian concepts of traumatic surgery. The equality of organizational and professional management is the first basic difference. The second is the time lag introduced by the military necessity of evacuation. The third is the necessity for constant movement of the wounded man, and the fourth — treatment by a number of different surgeons at different places instead of by a single surgeon in one place — is inherent in the third. These are all undesirable factors, and on the surface they seem to militate against good surgical care. Indeed, when the over-all circumstances of warfare are added to them, they appear to make ideal surgical treatment impossible. Yet this was not true in the war we have just finished fighting, nor need it ever be true. Short cuts and measures of expediency are frequently necessary in military surgery, but compromises with surgical adequacy are not.

A number of factors, some inherent in the military circumstances and others created by proper concepts and derivative planning, overcame the obstacles to ideal surgery in World War II. The first of these was what might be termed the standardized pattern of trauma and of physiologic response to it. Most of the diagnostic confusions of civilian medicine do not exist in military surgery, although, naturally, I do not mean to imply that serious diagnostic problems are not involved. On the other hand, whether a wound is in the extremities or in the abdomen or

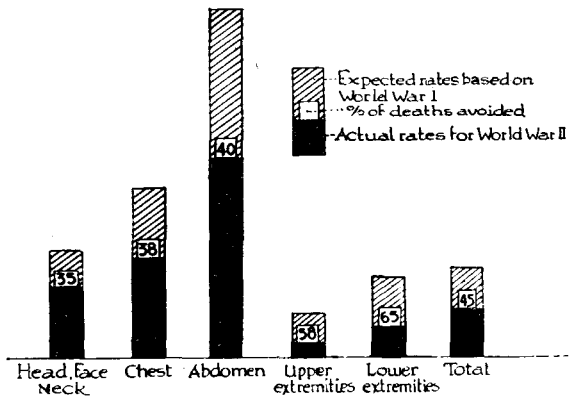

FIGURE 3. *Percentage of Expected Deaths (Based on World War I Mortality Rates) Avoided in World War II.*

chest, or is caused by a high explosive, a land mine or a jeep, the pattern assumes the same general characteristics; the physiologic response, whether actual or potential, can be assumed to be similar, and the therapy required, resuscitative as well as surgical, follows the same general lines. Furthermore, the United States Army consisted on the whole of a selected group of men, in the best years

of their lives, in whom physical defects and chronic and degenerative diseases had been excluded by preliminary screening.

At least two planned factors also compensated for the unfavorable background of military surgery. The first was the principle of standardization or, as some might choose to term it, of regimentation. The framework into which the wounded man and the medical officer were alike required to fit was frankly rigid. But within the framework individual initiative was both permitted and encouraged, the ability and skill of the experienced surgeon were stimulated, and the less experienced surgeon was provided with training and guidance. As always, a general uniformity of technical procedure was regarded as essential, for reasons of safety, simplification and expedition, to make mass instruction of the medical personnel feasible and to permit standardization of basic equipment. I might interpolate that the directives and other means by which information and advice were disseminated were based on actual experience and represented the composite, carefully arrived at conclusions of many surgeons rather than the whims and practices of a single surgeon or one group of surgeons.

A second compensatory factor was the precise definition of the function of each echelon in the chain of evacuation, from the first aid given on the battlefield by medical corpsmen to the reparative surgery performed in the general hospital at the base. Each procedure was timed and graded in relation to the whole picture, including the tactical situation, the particular point in the chain of evacuation and the wounded man's own status. Hospitals were designed and equipped for surgery of varying degrees of urgency and magnitude, with due consideration of the necessary duration and other requirements of postoperative care, and were strategically placed with reference to those considerations.

Professional personnel were distributed in accordance with the function of the installation and the type of surgery to be performed. It is to the credit of a profession of individualists that almost every man submitted to these medicomilitary disciplines, recognized their necessity and justice, and confined himself to the job he was assigned to do where, when and as he was directed to do it.

Regimentation was based on fundamentally sound principles. The directives provided, for instance, that except for maxillofacial and cranial injuries, all wounds must be left unsutured after débridement, that all amputation stumps must be left unsutured, that transportation casts must be split or bivalved as soon as the plaster was dry and that injuries of the large bowel must be treated by exteriorization. Undoubtedly the transgression of any of these directives would have been practical and safe in numerous selected cases, but not much reflection is needed to make clear the folly of permitting the privilege of selection under combat conditions to thousands of surgeons who had been trained under varying schools of surgical thought and who were of varying degrees of ability and experience.

It was also necessary to view certain elective procedures in the cold light of military realism. What is good practice in civilian surgery is not necessarily the best practice, or even good practice, in military surgery. It was estimated, for example, that over a two-year period, 425,000 hospital days (approximately 1192 man years) were saved, and a corresponding amount of manpower time was made available, by the limitation of the treatment of pilonidal cyst and sinus to simple incision and drainage, or by the withholding of surgery altogether. Likewise, large savings were made and a great many difficulties circumvented by the adoption of conservative policies in the management of hydrocele,

internal derangements of the knee and herniated nucleus pulposus.

Perhaps the most striking illustration of the necessity of detailed planning and of the value of uniformity of organization is supplied by the processing of injured men on their return to the Zone of the Interior. For a period of some six months casualties from overseas were received at the ports at the rate of about 1000 a day. For a few months they numbered almost 2000 a day, and a large ship, such as the *Queen Mary*, might transport as many as 3000 at a time. Yet day after day, within an average of seventy-two hours of their arrival, most of the injured men were on their way by train or plane to the general hospitals selected as appropriate for them after assessment of their specialized needs at receiving hospitals on the coasts, procurement of authorized bed space from Washington and as much consideration as possible of the proximity to their homes of the hospitals to which they were sent. A triage of such monumental proportions would have been a remarkable achievement no matter how it was accomplished. That it was carried out with minimal errors in assignment and with no accidents of any consequence is as much a tribute to the planning of this special operation as it is clear-cut proof of the necessity for standardization of procedure.

The competent performance of the surgical personnel who participated in World War II undoubtedly had more to do with the surgical results achieved than any other single factor. That performance was made possible, in turn, by the increased availability of such personnel, in comparison with World War I, and by proper assignment.

The principles of specialization, as the term is understood today, had scarcely developed when the United States entered World War I. The Surgeon General, however, showed his awareness of the trend and took official cognizance of it by the appoint-

ment of a civilian specialist to advise him concerning surgery and the surgical specialties. This officer, who entered the Army with the rank of major and who served only part time, was responsible for the later selection of an advisory board, quite loosely organized and appointed on a geographic as well as a professional basis. At the same time, consultants in major specialties and subspecialties were appointed to overseas hospitals and units.

Although these concepts represented a real advance in military surgery, the theory of specialization was never fully translated into practice during World War I. The original development was undirected and unwieldy, and for a time the basic specialties of medicine and surgery were almost submerged by the independent mushroom growth of the subspecialties. Furthermore, the criteria of classification of specialists were elementary — they could hardly have been otherwise, for the modern system of residencies was practically unknown and the first of the qualifying boards did not come into existence until 1916. As a result, the applicant for a commission was graded chiefly on the basis of his personal statement of his qualifications and training, which, as might have been anticipated, sometimes bore little resemblance to the realities. At the end of World War I specialized military practice ceased to exist with the rapid demobilization of the Medical Corps and, for all practical purposes, remained nonexistent during the interval between the wars.

Many of the difficulties that attended the effective utilization of specialists in World War I were avoided in World War II. Within three months of our entrance into the war there was established in the Office of the Surgeon General a Professional Consultants Division of full-time officers, with ranks eventually appropriate to their duties, although the administrative authority with which they were

endowed was never fully adequate for their responsibilities. I need not repeat that the Surgical Consultants Division was headed by Brigadier General Fred W. Rankin, but I do want to pause to pay tribute to the native ability, the trained competence, the hard common sense and the uncompromising and unswerving honesty of purpose with which he carried out his duties, with the single-minded objective of providing for American soldiers the best surgical care any army has ever had.

As the war progressed, consultants in the major specialties, and usually in the subspecialties, were eventually appointed in every service command in the Zone of the Interior and in the Mediterranean and European theaters. The system, most regrettably, was never fully implemented in the Pacific, partly because of shortages of personnel and partly because of the deliberate postponement of the major effort in that area until the conclusion of the war in Europe. These consultants were selected with the utmost care, on the basis of training, ability, accomplishments and professional eminence, as a Boston audience need not be reminded, since the chief consultant for the Mediterranean Theater was Colonel Edward D. Churchill and the chief consultant for the European Theater was Brigadier General Elliott C. Cutler. From the medical standpoint, these were the important theaters, and Colonel Churchill and General Cutler exemplified to the highest degree the value of the consultant system and the possibilities of accomplishment within it.

The function of the surgical consultants was rather loosely defined as the promotion of the highest standards of medical practice within their areas of responsibility. They fulfilled it not primarily by the development of policies, but by the effective utilization and the continuing assessment and reassessment of specialized surgical personnel. When qualified personnel were properly assigned, policies developed

of themselves. These surgeons were well trained men, many of them with long experience in civil life. Their concepts of surgery were correct. They were thoughtful as well as technically able. Their minds were open, and they realized the importance of changing their original convictions in the light of altering developments and cumulative experience. They were widely distributed and traveled widely, so that their influence spread in ever-widening circles. It is no paradox to say that although most of them did no surgery and treated no patients in the course of the whole war, they were responsible for incalculable savings of life and limb.

Surgical Advances in World War II

No major revolutionary changes in surgical practice were introduced during World War II. On the other hand, because of the enormous, concentrated surgical experience, principles were rapidly established — and are now being applied in civilian practice — that in the ordinary course of events would have taken years to establish. Furthermore, as the war progressed, there was an extraordinary appreciation, as well as a remarkably intelligent application, of fundamental principles so adapted as to meet the exigencies of military surgery. We were slow to learn some lessons and slow, perhaps, to utilize our experiences, but eventually certain concepts in the various fields of surgical endeavor became more clearly defined and their technical application became more general, with progressive improvement in mortality and morbidity rates.

The major advance, which underlay the progressive improvement in results accomplished as the war progressed, was the concept of phased wound management developed by Colonel Churchill in the early days of the Mediterranean fighting. This principle recognized the factors in the military environment that precluded ideal surgical practice and

compensated for them by a rational timing of surgical measures to conform, in general, with the tactical necessities of the military situation. Its three phases were as follows: initial wound surgery, a function of advanced hospitals in the Army area, which was concerned with surgical procedures designed to save life and prevent or eradicate wound infection; reparative surgery, a responsibility of general hospitals in the Zone of Communications, which was concerned with procedures designed to shorten the period of wound healing, restore early function and minimize ultimate disability; and reconstructive surgery, a function of general hospitals in the Zone of the Interior, which was concerned with the correction of deformities and with rehabilitation in general.

The first and second phases of this plan took advantage of established principles of wound healing. From a military standpoint the entire concept was based on the fact that shortly after the first phase most patients, except those with penetrating wounds of the chest and abdomen, are safely transportable, whereas immediately after the second phase they become nontransportable for periods varying from a few weeks in cases of soft-part wound to several weeks in cases of fracture. By proper co-ordination of the three phases of this plan in time and space, a close approach — perhaps the closest approach possible — to ideal methods of wound management was achieved within the limits of a military setting.

It proved possible to apply this principle of phased surgery to virtually every type of wound. Colonel Churchill himself admirably explained its application to thoracic surgery in World War II, in which, as he noted, the lung rather than the pleural space had become the focus of medical attention. In this type of surgery, he continued, two phases had to be recognized: physiologic disturbances and infection. The former required immediate correction in

the most forward installation possible, sometimes by surgical measures; infection could occasionally be eliminated at the same time, but only incidentally. In general, the proper time to manage infection was within three days to six weeks after injury, and the place to correct it was an installation to the rear.

The phased management of abdominal injuries involving the large bowel required, in oversimplified terms, exteriorization of the injured segment in a forward installation, with subsequent closure of the colostomy in an installation in the rear. The phased management of fractures implied débridement of the wound and immobilization for transportation purposes in a forward installation, with later precise reduction and wound closure in a rear installation. Peripheral-nerve injuries, according to this principle, were débrided at initial surgery and sutured within an optimum period after delayed wound closure either overseas or in the Zone of the Interior, usually depending on the availability of transportation. Head and spinal-cord injuries and all other types were managed by similar temporal and spatial concepts.

Even the concept of resuscitation — ably developed in the Mediterranean Theater by Colonel Henry K. Beecher and based on a newer knowledge, largely provided by him and his associates — was phased, its objective being to present to the surgeon a patient who would be as favorable an operative risk as possible. Time does not permit a discussion of the important role played by this group of physicians in the delineation of the respective places of plasma and whole blood in resuscitation, in their bringing us back to sanity in the use of morphine (for which, they showed, a cigarette is sometimes an excellent substitute) and in anesthetic methods in wartime, a consideration of which would be peculiarly appropriate at this time and place.

A matter that statistics do not show and that deserves far more than the passing comment possible is the new approach to rehabilitation and reconstruction characteristic of surgery in World War II. Maxillofacial surgery achieved apparently impossible results, as did surgery of the hand. Programs of rehabilitation were designed for deaf and blind patients and for those who had lost limbs. The paraplegic program was not only a medical triumph and a shining illustration of the humanity with which the science of surgery can be practiced but also a brilliant example of how co-operative medicine should be practiced.

Research Activities in World War II

The research activities of World War II, brilliant as many of them were, furnish another excellent example of the lessons that we failed to learn from World War I. Important advances were made in various fields, but they were made late, after many hesitations and false starts, and in retrospect, it is easy to see how many opportunities were lost.

Significant information was obtained in World War I by research studies in overseas theaters concerning shock and hemorrhage, and by similar studies in this country regarding empyema. The data thus obtained were of great value in furthering knowledge of these subjects. Yet in spite of that experience, the policy in the early days of American participation in World War II discouraged clinical investigations in Army hospitals, research problems being referred to the National Research Council for investigation by civilian workers. The barrier thus set up was never completely crossed and was the chief reason for the delays and other inadequacies that attended the research problem throughout most of the war.

As the war progressed, the original policy discouraging research in Army installations was neces-

sarily modified, and studies on special problems by small groups of investigators in the field proved feasible and valuable. Some of the studies carried out by members of the staff of the Massachusetts General Hospital and of the faculty of Harvard University provided information of the greatest value concerning the physiologic responses to shock, the bacteriology of wounds, the indications for transfusion in war surgery and, as mentioned above, the respective areas of usefulness of plasma and whole blood.

Isolated studies by individuals also frequently proved valuable, but many of them were invalidated by the lack of scientifically planned controls, and most represented an unnecessary waste of time, effort and personnel. During the war the Army Epidemiological Board had repeatedly shown what could be achieved by an organization prepared to function as soon as and wherever the necessity arose, and that board — and this is significant — functioned directly under the Secretary of War, with all the prestige and advantages of his authorization. It was not until August, 1945, when the great need and the great opportunity alike ceased to exist, that the Army Medical Research Board, with proper clinical representation, was finally set up in the Surgeon General's Office.

So much for the Army side of research during the war. Parallel, but seldom co-ordinated or integrated with it, was the effort of the Division of Medical Sciences of the National Research Council. Its valuable work, to which I am glad to pay my own personal tribute, is undoubtedly familiar to all. Nonetheless, from the standpoint of military surgery, it never completely succeeded in accomplishing its objectives, because of the barrier between military surgeons and civilian investigators that was never completely crossed on either side. Liaison existed between the Army and the various subcommittees

of the National Research Council, it is true. Data from the field were supplied to the civilian investigators within the limits permitted by security regulations. Security regulations, unfortunately, were too often interpreted and applied with extreme severity, and medical documents that would have been of the greatest usefulness to research workers were classified far beyond the limits required by military security. Reports were made to appropriate subcommittees by occasional surgeons returned from overseas, and an occasional observer from the Council made surveys in the field. But complete integration of ideas and purposes was almost never achieved — not through any fault of personnel or through any lack of desire, but because of the initial setup. The failure was fundamentally due to the artificial and fallacious concept that a military problem could be detached from its military background, solved as an abstract problem in a civilian laboratory by civilian investigators who had no contact with it at its point of origin, and handed back to the military surgeons, completely solved and accompanied by appropriate therapeutic recommendations. Working in their own airtight compartments, civilian investigators naturally could not develop a true concept of the background of military surgery, which differs in many respects, as emphasized above, from civilian surgery. Nor could they ever fully understand the special necessities of military surgery or its special urgencies. It is extremely significant, and indicative of their medical competence, that the civilian investigators themselves realized these handicaps. In its final report in September, 1944, the Subcommittee on Surgical Infections and Burns recommended that thereafter such projects be carried out by qualified groups in the Services and that future civilian projects be limited to laboratory and other studies that could not be conveniently carried out in military hospitals.

The slow development of an optimum method for the treatment of burns is an illustration of the lack of integration of research studies and military surgery. Authoritative pronouncements were badly needed. In 1939, at the beginning of the war, tannic acid was the most widely used of all local agents. It was not satisfactory, but no other of the multiple methods then in use was considered any better. In October, 1942, the Subcommittee on Burns of the Division of Medical Sciences of the National Research Council, in response to a communication from the Surgeon General, recommended that the Army postpone further purchases of tannic acid until additional information could be obtained. During the following month, in spite of a statement by the chairman early in the discussion that tannic acid jelly should not be used for either first-aid or definitive therapy, the tanning (eschar) treatment was recommended by the subcommittee for certain rather large categories of burns, and it was not until July, 1943, that the discontinuance of all escharotics was recommended and the substitute recommendation was made that first-aid measures consist only of the application of an oily, nonadherent agent, such as petrolatum.

By the time this conclusion was reached, the Surgical Consultants Division, on the basis of clinical experience in the North African Theater of Operations, which had clearly proved the ineffectiveness and actual danger of the eschar treatment, already had in preparation and on its slow way through channels a circular letter forbidding the use of any tanning agents and recommending simple pressure dressings, whose effectiveness had first been mass tested in the Cocoanut Grove fire in November, 1942.

The evolution of recommendations concerning the use of chemotherapeutic agents was similarly slow. In July, 1940, the Subcommittee on Surgical Infections, in collaboration with the Committee on

Therapeutics and Other Agents, had recommended the oral prophylactic administration of some sulfonamide drug as soon as possible after injury, as a means of preventing infection. It was reluctant to advise the local use of these drugs because, in spite of lay and professional enthusiasm for the practice, no adequate data were available to justify such treatment. Eventually, however, in response to an urgent request from the Surgeons General of the Army and Navy for a ruling, local chemotherapy was recommended. As a result of these recommendations, the individual first-aid kit was provided with sulfonamide tablets for oral use and with dusting powder for use in wounds.

When funds became available to the National Research Council, controlled studies were instigated under its auspices and were carried out by competent investigators in civilian hospitals in more than 2000 cases of traumatic wounds. The conclusion was reached, after the first 1000 cases had been analyzed, that when predisposing factors exist for the development of infection in accidental wounds, the use of chemotherapeutic agents in any combination and by any route does not prevent its development, although systemic therapy is probably of value in preventing invasive sepsis. In its final report, in September, 1944, this conclusion was retained, but the subcommittee declined, because of the differing conditions in civilian casualties and battle casualties, to institute comparisons, nor would it make any recommendations for the use or the omission of bacteriostatic drugs as prophylactic agents in the prevention of local infection in war wounds.

The reports from Pearl Harbor seemed to indicate that both local and systemic chemotherapy was highly effective in battle wounds. Undoubtedly much of the early reliance on chemotherapy was due to that experience. In the enthusiasm over the results, however, many Army and Navy surgeons, as well as many civilian surgeons, lost sight of the

emphasis that these reports also placed on adequate surgery. As early as 1943, numerous reports from the Mediterranean Theater, later supplemented by reports from the European Theater, substantiated the conclusions of the National Research Council workers regarding the ineffectiveness of local chemotherapy in wound infections. Soon afterward, a directive was issued forbidding the local use of the sulfonamides, and they were no longer placed in the first-aid kit in any form.

It is pleasant to be able to report that most of these errors and hesitations were avoided in the study of penicillin and streptomycin. The investigations were set up by civilian investigators working under the National Research Council, and the projects, when they were fully operative, were taken over and carried on with great success by members of the Army Medical Corps specially assigned to and specially qualified for the work. The result was that when these agents were made generally available, the principles of usage had been clearly established and their limitations and risks had been equally clearly defined. Both projects represent the type of integrated civilian-military research that, unfortunately, so many other projects do not, and point the way to future planning for research in a similar emergency.

The Implications of Military Surgery in the Postwar World

I hope that nothing that has been said will be interpreted to mean that the Medical Department of the United States Army did not do a competent job in World War II. It functioned superbly. No soldiers in any war ever had such care as was given to the American soldiers in the last war. If, on the other hand, what has been said seems to indicate that the formulation of policy of military surgery in World War II was a matter of evolution, it must be

admitted that the implication is correct. The Medical Corps, like most other branches of the Army, entered on the emergency of World War II quite as unprepared as it had been at the outbreak of World War I. In large measure this was not the fault of the Surgeon General. For one thing, the American public, as always during years of peace, had shown no enthusiasm, but rather apathy and sometimes actual hostility, for planning for another war. Congress, the source of funds, had followed the same line.

Furthermore, and even more important, successive surgeons general of the Army, whatever their convictions, had little or no authority to act on them. In the midst of World War I, over the protests of the Surgeon General then in office, the Medical Corps of the Army, previously an entity in its own right, had been placed under the Service of Supply (later the Army Service Forces) and by this move, in spite of his sole responsibility for the health and medical care of the Army, the Surgeon General had been cut off from direct access to the Chief of Staff and the Secretary of War. Professional personnel, for all practical purposes, was reduced to the status of rations and ammunition. As the Chief Surgeon of the American Expeditionary Forces protested when the change was made: "The present organization . . . places a line officer of the General Staff in position to pass upon or present for higher consideration all matters of fundamental policy affecting the Medical Department. He can nullify the most carefully worked out program having for its object Medical Department efficiency." The Surgeon General, in short, could continue to raise his voice on medical matters, but he no longer had any certainty that it would be heard. He continued in this unhappy position in the interim between the wars and through most of World War II. By April, 1945, however, the anomaly of his status had given rise to so much confusion that it became

necessary to clarify his duties and responsibilities by a War Department Circular, concurred in by the Secretary of War, who at that time assumed direct responsibility for the sick and wounded of the Army.

The anomalous position of the Surgeon General was responsible for many of the medical troubles encountered in World War II. Prestige cannot be established by regulations; rather, it is the product of successful achievement. Nevertheless, the position in which the Medical Department was placed in the organizational structure of the Army cannot be regarded as conducive to the enhancement of its prestige. The Surgeon General's advice might not be asked, even on matters that directly concerned the health and well-being of the troops. If it were requested or offered, there was no assurance that it would be accepted, translated into proper action or translated into any action at all. The situation demands correction: the Surgeon General must, of course, be subject in tactical matters to purely military command, but he must also again become master in his own medical house. His position must be so clarified that he can carry out his responsibilities and functions under the direction of a medically enlightened command, which is fully aware of the part played by the Medical Department in the actual business of warfare and which realizes, as Sir Alexander Hood has well put it, that "the medical services are the authorities on man and all that concerns him."

An important by-product of the anomalous position of the Medical Department in World War II was its lack of direct control over its own personnel. When that handicap was added to the structural organization without which, in spite of its cumbersomeness, an army in the field cannot operate, the inevitable result was a wastage of trained personnel that became increasingly acute as the war went on and that, had it lasted longer, might have been

reflected in the care of the wounded. The problem was solved to some degree by the assignment of appropriate specialists to the points at which they could be most useful and by the concentration of patients with special types of injuries in centers equipped and staffed for their care; shortages of critical personnel, however, were always troublesome, and some of them were artificially created.

Such a situation must be avoided in the future. The medical profession is fully committed to the principle of specialization. It was employed in World War II far more extensively than in World War I because of two tendencies that had taken form in the interim between the wars. One comprised the efforts by civilian medical schools and hospitals to improve and standardize medical specialization by the provision of residencies and other facilities for postgraduate medical education. The other was the certification of specialists by the various qualifying boards. Neither of these tendencies, as already pointed out, existed prior to World War I, and it was the reservoir of specialists created between the wars that made possible the specialized and highly competent medical care given the wounded in World War II.

The philosophy of specialization in medical practice was based on too firm a foundation to have been overturned by a temporary, albeit catastrophic, interruption. The framework of its implementation, as a matter of fact, was actually strengthened by the experiences of the war and the performance of the specialists themselves. Specialization has now received legal recognition. It has been written into the laws governing the Veterans Administration, which, as a result, is providing for its charges medical care of a quality that it has never before provided. Equally strong efforts are now being made to continue specialization as an Army policy. The responsibility of the certifying boards and of

teaching hospitals and medical schools, therefore, seems to be heavier than ever before, and the leaders in graduate educational endeavors must take full cognizance of the fact.

On the other hand, the policy of specialization must be applied with discretion and, so far as the Army is concerned, with understanding of military conditions. During World War II, as in every previous war, medical officers of the Regular Army necessarily assumed administrative positions. Their training had presumably fitted them better for those posts than it had for specialized professional service, whereas the civilian components of the Medical Corps were in most instances untrained for administrative posts, in which their specialized training and experience would have been wasted. Generally speaking, this is a sound policy. On the other hand, the experience of World War II amply demonstrated the fallacy of the assumptions that a medical officer trained in a peacetime army was a priori fitted to assume a key administrative position during war and that a civilian surgeon necessarily lacked the qualities of leadership, judgment and vision required for it.

The degree of specialization to be required in the future Regular Army is difficult to determine at present. The size of the future military establishment is still undetermined, and specialization, to be practiced effectively, requires concentrations of clinical material. The wisest plan may be for the Medical Corps of the Regular Army to provide the administrative structure and the general care of the troops, as well as the medicomilitary planning and training operations, leaving specialized hospital care to be supplied by a system of civilian consultants or of integrated federal medical service. The important consideration at present is not how the specialized care is to be supplied but that its necessity be recognized and, at the same time, the

pitfall of too narrow specialization be avoided. It must also be constantly borne in mind that specialized practice emphasizes remedial medicine and that the Medical Department is a great deal more than a salvage service. The practice of preventive medicine and the planning for future operations are even more vital functions in war than in peace, In both its most valuable function is its advice to command.

The problem is not quite so simple, however, as this statement of policy implies. Other considerations are linked with purely military matters. During the war obvious shortages of personnel developed and certain specialists were always in critical supply, but the opinion was that once the war had ended, these difficulties would resolve themselves. They have not resolved themselves, nor does any thinking physician believe that they are likely to, at least under the system by which federal services are now operated.

It would be difficult to imagine a more wasteful and extravagant plan, for example, than the one on which hospitalization in this country is currently conducted. We have a system of private hospitals, of widely varying size and excellence. We also have, exactly as we had at the beginning of World War II, a fourfold, parallel system of federal hospitalization, including separate establishments for the Army, the Navy, the Veterans Administration and the Public Health Service, with confusion worse confounded by the maintenance of separate installations, sometimes only a few hundred yards apart, for the Air Forces and the Ground Forces. What this means in terms of wastage of material and equipment and money is perfectly obvious; what it means in terms of wastage of professional personnel, particularly of specialized personnel, may not at first glance be so clear.

It has been conservatively estimated that the various governmental agencies supplying medical care will soon need half a million hospital beds. That is a third of the present hospital-bed capacity of the whole country. As the need for bed space multiplies, so will the need for professional personnel, particularly for specialized personnel, who cannot be supplied by the present system. Sane thinking therefore indicates the merger of the present separately maintained federal establishments, at least on the hospital level in the Zone of the Interior, which would reduce the needed professional personnel by 50 to 75 per cent, greatly increase efficiency of operation and greatly reduce costs. The conservation of specialized personnel, along with their efficient use, is one of the lessons that should have been learned for all time from the surgical experiences in World War II.

At present, from the standpoint of medical practice as well as in a number of other respects, we are acting from day to day. We have no plans and, worse, we have no principles to guide our course of action. Such a situation must not be permitted to continue. The surgical problems of World War II far exceeded in magnitude those of World War I. The problems of a possible third world war, about which we shall be criminally negligent if we are not entirely realistic, are likely to exceed to a staggering degree those of World War II. The end of World War II may indeed have marked the end of an era in military surgery, which for centuries had followed a pattern that, although progressively more demanding, was still essentially similar. Much of the knowledge we now possess, however, may become irrelevant and useless in this new era. There will necessarily be a new concept of war wounds. Radiation, blast and burn injuries of atomic origin will pose problems of management different from those hitherto associated with surgical care, and there

must be a new concept of traumatic surgery in terms of regional injury.

Furthermore, the introduction of atomic weapons is likely to wipe out the old concept of echelons of combat and areas of security, and to bring civilians and military forces together into a single zone of combat. Atomic warfare is likely to cause an instantaneous flood of casualties, such as no battle in the history of the world ever before produced. It will require the full use of all hospital facilities, on an over-all basis, with no wastage of beds, as well as the strategic placement of all equipment for general use as needed. Above all, it will require the mobilization of the entire medical personnel of the Nation on a disaster basis. There can be no distinction between military and civilian medical responsibility, for there will be no distinction between military and civilian injuries. It will require a mobility and speed of assignment of medical and surgical personnel such as has never before been necessary. There can be no more wastage of physicians. The problem, indeed, may be to keep the medical personnel of the country protected and alive and sufficiently uninjured to carry out their functions.

I should not like to end on this note. I do not believe that so dark a future will come soon, or that it is inevitable. But we should be lacking in realism and deserving of our fate if we did not face the possibilities frankly and take steps to forestall, prevent and prepare for disaster. Changes will be necessary: changes in the concept of medical education, changes in the methods of graduate education, changes in the plan of medical practice and changes in the relation and attitude of the civilian medical profession toward the federal medical services, including the Army and the Navy. To bring them about will take authority on a high level, which is now lacking on any level and which, when it is set

up, must be exercised with wisdom and judgment and great discretion. Without medical statesmanship of a high order, these objectives cannot be attained.

Obviously, the experiences of World War II cannot be transferred directly to a possible atomic war. They must not, however, be discarded lightly. For the present, at least, they are all we have to go on. They supply some solid point of departure, in spite of the changes that must be made. The future of atomic warfare is uncertain, but the lessons of the last war will help, and certainly if we learn them, we shall be in a position of vantage that we have never before occupied at the beginning of any previous war.